

(54) WALL PANEL

(11) 3-208936 (A) (43) 12.9.1991 (19) JP

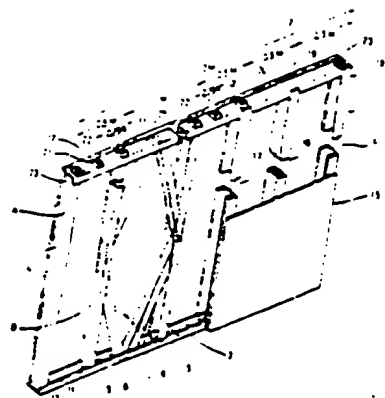
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(51) Int. Cl. E04B2 00.E04B2 56

PURPOSE: To increase an efficiency of an assembling work, by providing a reinforcing part composed of inner frame members and braces in a peripheral frame and forming a jointing part in the neighborhood of the junction of the inner frame members and at the position departed from the jointed edge.

CONSTITUTION: An upper frame member 2 and a lower frame member 3 made from channel steels are connected to form a rectangle with a vertical member 4 at the edges thereof to define a peripheral frame and to make a large frame with the length three times as long as the module M. And a frame M is provided with a reinforcing frame 7 composed of inner frame members 5 in parallel with the peripheral frame A and diagonally connected braces 6. Moreover, the jointed edges of the inner frame member 5 are provided in the upper and lower frame members 2, 3 and conjunction parts 11, 12 are provided at the departed position from the jointed edge and panel member 15 are placed on both the front and rear faces to form a wall panel 1. In this way, the workability can be increased.



Section 9. Concise Explanation of English Language Listed Information Items (OPTIONAL)

NOTE: "Applicants may, if they wish, provide a concise explanation of why English-language information is being submitted and how it is understood to be relevant. Concise explanations are helpful to the Office, particularly where documents are lengthy and complex and applicant is aware of a section that is highly relevant to patentability or where a large number of documents are submitted and applicant is aware that one or more are highly relevant to patentability." Notice of April 20, 1992 (1138 O.G. 37-41, 38).

The following items listed are being sent in connection with this invention for the first time:

USPN: 3,612,291; 4,366,659; 4,435,932; 4,441,289;
5,218,803; 5,657,606; 6,006,487; 6,018,917

Australia PN: 228,186 and Japanese PN: 3208936

Pending USPA Serial No. 08/670,500

Examiner has seen the references on sheets 2-10 of FORMS PTO/SB/08A and sheets 2-5 of PTO/SB/08B. Sheet 1 of PTO/SB/08A and sheet 1 of PTO/SB/08B are new.

Section 10. Identification of Person(s) Making This Information Disclosure Statement

The person making this statement is

(check each applicable item)

- (a) ☐ the inventor(s) who signs below

SIGNATURE OF INVENTOR

(type name of inventor who is signing)

- (b) ☐ an individual associated with the filing and prosecution of this application (37 C.F.R. § 1.56(c))

SIGNATURE OF INVENTOR

(type name of inventor who is signing)

- (c) ☒ the practitioner who signs below on the basis of the information:


(check each applicable item)

- ☐ supplied by the inventor(s).
☐ supplied by an individual associated with the filing and prosecution of this application. (37 C.F.R. § 1.56(c))
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FULL TRANSLATION ATTACHED

⑩ 特許出願公開

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平3-208936

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審査請求 未請求 請求項の数 1 (全5頁)

⑭ 発明の名称 壁パネル

⑰ 特 願 平2-4953

⑱ 出 願 平2(1990)1月12日

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明 細 書

1. 発明の名称

壁パネル

2. 特許請求の範囲

1 長尺の上の枠材、下の枠材の両端を縦の枠材により接合した周囲枠材に、前記上、下の枠材を接続する平行な中の枠材と、該中の枠材間を斜めに結ぶブレースとからなる補強枠部を形成した枠組を具えるとともに、前記上の枠材、下の枠材と前記中の枠材の接続端近傍と、補強枠部から離れる向きに接続端から隔てた位置とに家屋構造体と結合する結合部を形成してなる壁パネル。

3. 発明の詳細な説明

〔産業上の利用分野〕

本発明は、家屋の耐力を向上するとともに、階上、階下に共通して使用可能とした壁パネルに関する。

〔従来の技術〕

壁、床、屋根等をパネルを用いて形成するパネル工法の家屋がある。又このようなパネル工法に

は、パネルを連結金具により結合するパネル組家屋の他、柱、梁等を用いて家屋構造体を形成したうえ、この家屋構造体にパネルを取付ける、軸組工法の家屋がある。

このような軸組工法の家屋において、家屋の剛性を高め、耐力を向上するには、従来、第4図に示すように、鋼製の周囲枠aの内部に斜めのブレースbを組み込んだ、いわゆる耐力パネルCを用いてきた。しかも、階上、階下の剛性バランスの観点から、階上の耐力パネルC2は、階下の耐力パネルC1に比べて、巾寸法を小かつ周囲枠a、ブレースbの剛さを小とすることにより、剛性を減じるなど、階下の耐力パネルC1と、階上の耐力パネルC2とは異なるものを利用して来た。

これは、例えば第5図に例示するごとく、階上にも階下の耐力パネルC1を用いるときには、風圧、地震等により横方向の力Pが作用することにより、その力Pをそのまま二階梁Dに作用し、大きな垂直荷重Fを負担させる。従って、二階梁Dに変形を生じさせ、これに對えるには二階梁Dの

剛性を過度に増大しなければならず、過剰品質となる。

なお第6図に示すように、階下にも階上の耐力パネルC2を用いるときには、階下部分の耐力が小さく、多くの耐力パネルC2を階下に配することが必要となるなど、経済性に劣る。

(考案が解決しようとする課題)

このように、階上、階下においては、剛性、寸法の異なる耐力パネルC1、C2を用いてきたため、耐力パネルC1、C2の種類が増し、設計、在庫、組立等に手間を要するという解決すべき課題があった。

他方、近年、運送事情の向上に伴い、壁パネル自体の巾寸法を大型化することによって、搬送、建込み等の施工作業を向上した大型の壁パネルが採用されつつある。

本発明は、大型の枠組を採用するとともに、階上、階下に共通して使用可能とすることにより、前記課題を解決でき、かつ建込み施工をも効率化しうる壁パネルの提供を目的としている。

二階梁からの力を基壁に伝達できる。又階上に取付く場合には、前記離れた位置の結合部により結合することによって、接続端と結合部との間がパネル性を有して変形でき、二階梁、屋根梁に作用する垂直力を減じるとともに、その弾性変形によりエネルギーを吸収し、二階梁、屋根梁とともに家屋の損傷を減じる。

(実施例)

以下本発明の一実施例を図面に基づき説明する。

図において壁パネル1は、上の枠材2、下の枠材3の両端を縦の枠材4、4により矩形に接合した周囲枠Aに、平行な中の枠材5、5とその間を斜めに結ぶブレース6……とからなる補強枠部7を設けた枠組Bを具え、又上、下の枠材2、3には、前記中の枠材5、5の接続端と、該接続端から離れる位置とに結合部11、11、12、12を設けており、又枠組Bの変置には面材14、15を添設している。

前記上、下の枠材2、3、縦の枠材4はともに断面同形の溝形鋼からなり、その溝部を内向けに

(課題を解決するための手段)

本発明は、長尺の上の枠材、下の枠材の両端を縦の枠材により接合した周囲枠に、前記上、下の枠材を接続する平行な中の枠材と、該中の枠材間を斜めに結ぶブレースとからなる補強枠部を形成した枠組を具えるとともに、前記上の枠材、下の枠材とに前記中の枠材の接続端近傍と、補強枠部から離れる向きに接続端から隔てた位置とに家屋構造物と結合する結合部を形成してなる壁パネルである。

(作用)

枠組は長尺の上、下の枠材を縦の枠材で接合した大型の周囲枠を有する大型のパネル体となり、従って搬送、建込み作業が効率化できる。又周囲枠には、平行な中の枠材とブレースとからなる補強枠部を具えることにより、その取付けによって家屋構造物を補強できる。又前記中の枠材の接続端近傍と、接続端から隔てた位置とに結合部を形成している。従って階下では、接続端近傍の結合部により固定することにより、補強枠部を介して

かつ縦の枠材4両端の巾状部を向き合う上、下の枠材2、3に嵌合させかつ溶着することにより前記周囲枠Aを形成しており、又この周囲枠Aは、家屋における基準寸法であるモジュールMの例えば3倍長さ3Mの大型枠として形成される。

前記中の枠材5、5も、他の枠材2、3、4と断面同形の溝形鋼からなり、かつ溝部を向き合わせ両端の巾状部を上下の枠材2、3に嵌入しかつ溶接により接続している。これにより、中の枠材5、5と、その間で挟む上、下の枠材2、3が矩形枠を形成するとともに、該矩形枠内に前記ブレース6……を取付けることにより、前記補強枠部7を形成する。ブレース6は前記溝部に嵌入しうる溝形鋼を用いており、本例では、前記矩形枠内において、溝部を内向きにかつ縦長の変形状に配置される。

又本例では、中の枠材5、5は、モジュールMを隔てるとともに、一方の枠材5は、向き合う一方の縦枠材4から半分モジュール0.5Mを隔てる。なお上、下の枠材2、3間には、他方の縦の枠材

うから半分モジュール0.5Mを隔てて木質材からなる普通の部材16と、溝形鋼からなる継ぎ材17とを配している。又縦の枠材4、4、中の枠材5、5、継ぎ材16、17の裏面には木質かつ比較的薄い縦長の下地材19……を介して前記面材14、15を添設する。

なお前記下地材19により、鋼製の枠材4、5、17との間を断熱し面材14、15に生じる結露を防ぐとともに、下地材19、19間の各上下の間隙によって壁パネル1内部を換気でき、結露を防止しうる。

結合部11、12は、本例では上の枠材2の上面、下の枠材3の下面に夫々溶着される補強板21に、枠材2、3を貫通して穿設されるネジ孔22からなる。前記結合部11は、本例では、ネジ孔22を中の枠材5の接統端しかもその溝部のほぼ中間位置に位置させ、又結合部12は、前記ネジ孔22から、補強枠部7から離れる向きに該ネジ孔22から0.25Mを隔ててネジ孔22を形成している。なお前記縦枠材4、4、継ぎ材17

の上下にも、同様な結合部23……、24を設けている。

このような壁パネル1は、第2図に示すように、階下においては、接統端近傍の前記結合部11、11により、下端を基礎Gに、上端を二階梁Dに固定する。又階上では、離れた前記結合部12、12により、下端の二階梁Dに、上端を屋根梁Eに固定する。なお固定に際しては、アンカーボルト、梁D、Eを通るボルト等を用いて固定する。従って、地震、強風等により横向きの力Pが作用したときには、第3図に示すように、階上の壁パネル1においては、前記結合部11、12間の上、下の枠材2、3が夫々弾性変形し、変形エネルギーを吸収するとともに、結合部12が補強枠部7の中間から離れることにより、結合部12をへて二階梁D、屋根梁Eに伝わる垂直力Fを減じうる。さらに階下の壁パネル1の補強枠部7においては、結合部11、11間の下の枠材3が弾性変形し、エネルギーを吸収すると同時に、結合部11は中の枠材5の接統端に設けられることにより、大き

な耐力を負担すると同時に、その垂直力を基礎Gに伝達する。

このように、同一の壁パネル1、1を階上、階下で使用し、結合部11、12の使用位置をかえることにより、階上、階下に作用する力を効果的に吸収でき、かつ家屋構造体への垂直力を適切化し、家屋の耐力を高めうる。

なお本発明の壁パネル1において、上、下の枠材2、3は、基準モジュールの2倍又は4倍など種々な長さに設定でき、又補強枠部7も枠組9の中間位置、さらには一方の縦の枠材4の近傍に偏位させて設けることもできる。又結合部11、12とに、家屋構造体と結合する垂直片を用いるなど、種々変形しうる。

(発明の効果)

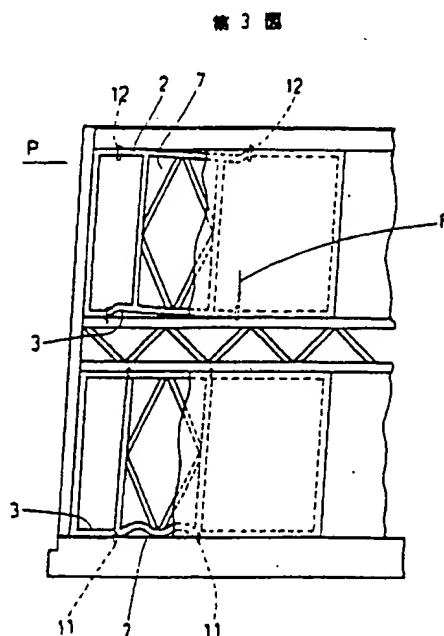
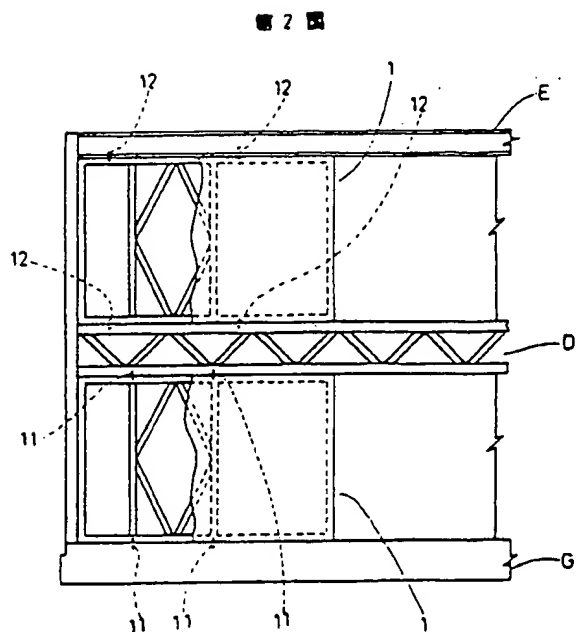
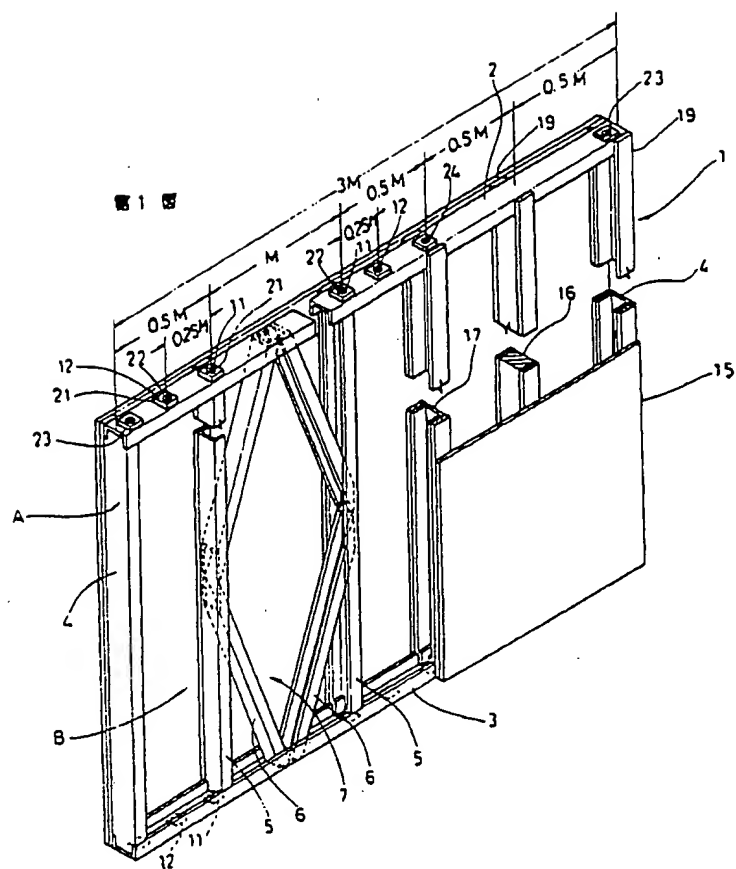
このように本発明の壁パネルは、大型の周囲枠を有する大型のパネル体を形成しており、従って搬送、建込み作業が能率化できる。又平行な中の枠材とブレースとからなる補強枠部を具えることにより、その取付けによって家屋構造体を補強で

きる。又前記中の枠材の接統端近傍と、接統端から隔てた位置とに結合部を形成し、階下では、接統端近傍の結合部により固定することにより、補強枠部を介して二階梁からの力を基礎に伝達できるとともに、階上に取付く場合には、前記離れた位置の結合部により結合することによって、接統端と結合部との間がバネ弾性を有して変形でき、二階梁、屋根梁にかわる垂直力を減じるとともに、その弾性変形によりエネルギーを吸収し、二階梁、屋根梁とともに家屋の損傷を減じる。

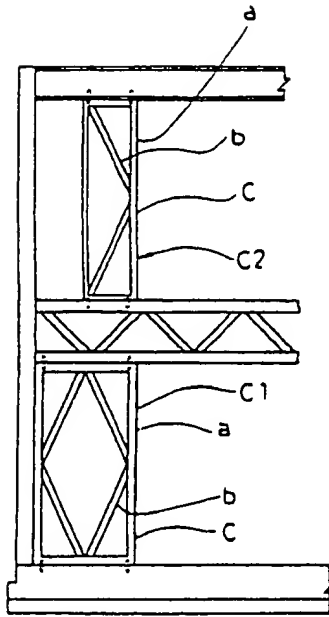
4. 図面の簡単な説明

第1図は本発明の一実施例を示す斜視図、第2図はその取付状態を示す正面図、第3図は変形の状態を示す正面図、第4図は従来構造を示す正面図、第5、6図は上下階に同一の耐力パネルを用いた状態を示す正面図である。

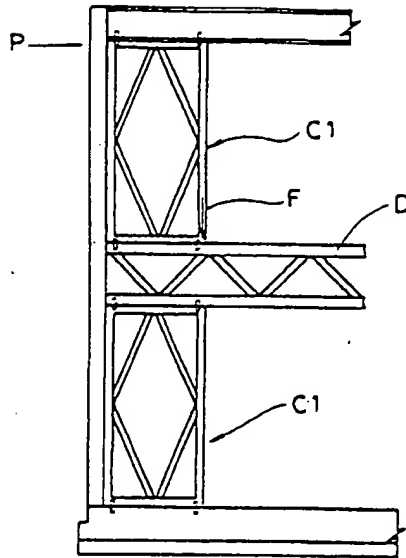
2……上の枠材、 3……下の枠材、 4……縦の枠材、
5……中の枠材、 6……ブレース、 7……補強枠部、
11、12……結合部、 14、15……面材、
A……周囲枠、 B……枠組。



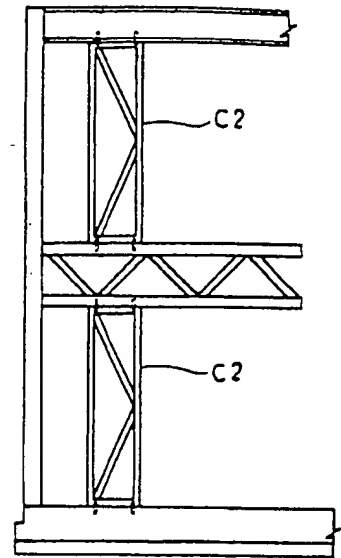
第 4 図



第 5 図



第 6 図



Attached please find the translation of Laid-open Patent H03-208936.

Comments are as follows:

1. "...the strength of a house..."

The Japanese uses a term that I would normally translate as "yield strength" or "proof stress" depending on the context. I don't think either fits well here. I elected to use the generic term "strength." The term is repeated several times throughout the patent.

2. "...to second floor beam D as large..."

I used the generic terms "column" and "beam" throughout. Item D looks more like a floor truss to me (in the drawings) but I remained faithful to the Japanese.

3. "...where M is a reference dimension ..."

The Japanese uses a phonetic rendition of the English word "module" synonymously with the word "dimension." In some cases they use the normal Japanese word for "dimension." I do not understand this usage of "module" and stuck with dimension. At any rate, I suppose "module" is where the letter "M" came from.

4. fittings 12 move away from the middle

Here the Japanese uses the present tense of the same verb that I otherwise translated as "removed" (meaning separated from or distanced from). I don't know if this is simply sloppy writing (highly likely) or if they actually mean to say that the fittings 12 move outward away from reinforcing section 7.

5. at an intermediate position within framework ??B or at a position

In the Japanese it looks like "framework 9" but I don't think there is an item no. 9.

General comment: I generally try to match up the item numbers from the figures in case someone is counting to make sure every thing is there.

However, in some cases the difference in Japanese and English grammar make this a difficult task. In a couple of cases I did not include repeated uses of item numbers that occurred in the Japanese because it would result in awkward English. If any questions arise as a result, do not hesitate to call.

Best regards,

David

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(12) Laid-open Patent Application (A)

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Identification Code

JPO File Nos.

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Request for Examination: Not yet submitted

Number of Claims: 1 (5 pages total)

(54) Title: Wall Panel

(21) Patent Application Number: H02-4953

(22) Patent Application Date: January 12, 1990

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Description

1. Title of the Invention

Wall Panel

2. Claims

1 A wall panel wherein:

an outer frame, comprising long upper and lower members joined by vertical members, is furnished with a framework having a reinforcing section comprising parallel middle members connected to said upper and lower members and braces connected diagonally between said middle members and

fittings for coupling with the structural body of a house are provided on said upper and lower members at positions in the vicinity of where the ends of said middle members are connected and at positions removed from said ends in directions away from the reinforcing section.

3. Detailed Explanation of the Invention

[Industrial Field of Application]

The present invention relates to a wall panel that improves the strength of a house and can be used for both the upper and lower floors.

[Prior Art]

There are houses that are built using panel construction methods, wherein the walls, floors, and roof are formed using panels. Among these houses are panel-built houses, wherein panels are joined using fittings, and frame-built houses, wherein a structural body is built using columns, beams, etc., and panels are mounted to the structural body.

In the case of frame-built houses, a steel outer frame *a* fitted with diagonal braces *b* to form a so-called load-bearing panel C (shown in FIG. 4) has typically been used to increase the durability and strength of the house. Additionally, compared to lower floor load-bearing panel C1, upper floor load-bearing panel C2 has a smaller width and the rigidity levels of its outer frame *a* and braces *b* are smaller, which reduces the rigidity of the panel. Thus lower floor load-bearing panel C1 and upper floor load-bearing panel C2 are not the same.

If, as illustrated in FIG. 5, load-bearing panel C1 were used on both the upper and lower

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in
United States of America

floors and a lateral force P caused by wind, an earthquake, or the like, acted on the structure, force P would be transmitted directly to second floor beam D as large vertical load F. Therefore, the rigidity of second floor beam D would have to be increased greatly in order to enable it to withstand the load with less deformation. The result would be an over-sized second floor beam D.

If, as illustrated in FIG. 6, load-bearing panel C2 were used on both the upper and lower floors, the strength of the lower floor portion would be small and many load-bearing panels C2 would need to be distributed on the lower floor, which is not economical.

[Problems the Invention Is to Solve]

As discussed earlier, load-bearing panels C1 and C2, which have different rigidity levels and dimensions, have been used on the lower and upper floors. The resulting increase in types of load-bearing panel C1 and C2 has complicated design, storage, and assembly procedures.

Meanwhile, recent improvements in the field of shipping have made it possible to carry wall panels with larger dimensions, and large-sized wall panels are beginning to be used to improve such construction operations as materials transport and erection.

The present invention comprises a large framework and can be used on both the upper and lower floors. The present invention is intended to provide a wall panel that can solve the aforementioned problems and improve the efficiency of the erection process.

[Means of Solving the Problems]

The present invention is a wall panel wherein an outer frame, comprising long upper and lower members joined by vertical members, is furnished with a framework having a reinforcing section comprising parallel middle members connected to said upper and lower members and braces connected diagonally between said middle members and fittings for coupling with the structural body of a house are provided on said upper and lower members at positions in the vicinity of where the ends of said middle members are connected and at positions removed from said ends in directions away from the reinforcing section.

[Operation of the Invention]

The invention results in a framework comprising a large panel having a large outer frame for which the long upper and lower members are joined by vertical members. Consequently,

the efficiency of shipping and erection work can be improved. Also, installation of the panels can reinforce the structural body of a house because the outer frame is provided with a reinforcing section comprising parallel middle members and braces. There are fittings provided in the vicinity of the ends of the middle members and at positions removed from said ends. Therefore, when used on the lower floor and affixed using the fittings in the vicinity of said ends, forces from the second floor beam can be transmitted to the foundation through the reinforcing section. When installed on the upper floor and coupled using the fittings located at said removed positions, the portion of the frame between the ends of the middle members and the fittings behaves as a spring and can deflect. This arrangement reduces vertical forces acting on the second floor beam and roof beam, and the elastic deformation of said portion absorbs energy, thus reducing damage to the house as well as the second floor beam and roof beam.

[Working Examples]

Below, a working example of the present invention is explained while referring to the drawings.

In the drawings, rectangular outer frame A of wall panel 1 is formed by joining both ends of upper member 2 and lower member 3 with vertical members 4, 4. Said outer frame is furnished with framework B, which is provided with reinforcing section 7 comprising parallel middle members 5, 5 and diagonally arranged braces 6. Fittings 11, 11, 12, 12 are provided on upper and lower members 2, 3 at positions in the vicinity of where the ends of middle members 5, 5 are connected and at positions removed from said ends. The front and back of framework B are provided with face members 14, 15.

Upper and lower members 2, 3, as well as vertical members 4, are made of steel and have a U-shaped cross-section. The U-shaped side of each member is faced inward and the narrow portions on both ends of vertical members 4 are fitted into opposing upper and lower members 2, 3 and welded to form said outer frame A. Outer frame A is formed as a large-sized frame with a length of, for example, $3M$, where M is a reference dimension for a house.

Middle members 5, 5 are also made of U-shaped steel, similarly to the other members 2, 3, 4, and are arranged with the U-shaped side facing one another and with the narrow portions on both ends inserted into upper and lower members 2, 3 and connected by welding. Thus, middle members 5, 5 and the portion of upper and lower members 2, 3 there between form a

rectangular frame. Reinforcing section 7 is formed by installing braces 6 within said rectangular frame. Braces 6 are made of U-shaped steel that can be fitted into the U-shaped portion of the other members and, in this working example, are arranged in the shape of a vertically oriented diamond with the U-shaped sides facing inward.

In this working example, middle members 5, 5 are separated by a distance of reference dimension M and one member 5 is separated by a distance of 0.5M from one of opposing vertical members 4. Also disposed between upper and lower members 2, 3 at intervals of 0.5M from the other vertical member 5 are joint member 17 and regular member 16, made of U-shaped steel and wooden material, respectively. Additionally, face members 14, 15 are provided on the front and back of vertical members 4, 4, middle members 5, 5, and joint members 16, 17 with wooden lining members 19, which are relatively thin and long in the vertical direction, disposed in-between.

Lining members 19 serve as thermal insulation between steel members 4, 5, 17 and prevent the formation of dew on face members 14, 15. Upper and lower gaps between lining members 19, 19 allow ventilation of the inside of wall panel 1 and enable the prevention of dew formation.

In this working example, fittings 11, 12 comprise reinforcing plates 21 welded to the top face of upper member 2 and the bottom face of lower member 3 and threaded holes 22 opened into and passing through members 2, 3. Also, in this working example, fittings 11 are formed so that threaded holes 22 are positioned at the ends of middle members 5 and roughly in the middle of the U-shaped portion of said members. Fittings 12 are formed so that the respective threaded holes 22 are positioned at a distance of 0.25M from the threaded holes 22 of fittings 11 in directions removed from reinforcing section 7. The same kind of fittings 23, 24 are also provided on the top and bottom of vertical members 4, 4 and joint member 17.

As shown in FIG. 2, when wall panel 1 installed on the lower floor, fittings 11, 11 are used to secure the lower end to foundation G and the upper end to second floor beam D. When the wall panel is used on the upper floor, fittings 12, 12 are used to secure the lower end to second floor beam D and the upper end to roof beam E. Anchor bolts, bolts that pass through beams D and E, or the like are used to secure the wall panel. Consequently, when a lateral force P acts due to an earthquake or a strong wind, upper and lower members 2, 3 of the upper floor wall panel 1 undergo elastic deformation between fittings 11, 12, as shown in FIG. 3. This elastic deformation absorbs energy. Also, since fittings 12 move away from the middle of reinforcing section 7, vertical forces F that are transmitted to second floor beam D and roof

beam E through fittings 12 are reduced. Meanwhile, lower member 3 of the lower floor wall panel 1 undergoes elastic deformation between fittings 11, 11 in the vicinity of reinforcing section 7 and absorbs energy. At the same time, since fittings 11, 11 are provided at the ends of middle members 5, they can withstand large loads and transmit the vertical components of those loads to foundation G.

Thus, identical wall panels 1, 1 can be used on both the upper and lower floors. By utilizing the different positioning of fittings 11, 12, the forces that act on the upper and lower floors can be efficiently absorbed and the vertical forces that act on the structural body of a house can be reduced to a reasonable level, resulting in a stronger house.

The upper and lower members 2, 3 of wall panel 1 can be designed to various lengths, such as two or four times the reference length. Reinforcing section 7 can also be provided either at an intermediate position within framework B or at a position closer to one or the other of vertical members 4. Numerous other variations are also possible, such as using a vertical piece that couples with the structural body of the house as fittings 11, 12.

[Effects of the Invention]

A wall panel in accordance with the present invention is a large panel having a large outer frame and can therefore improve the efficiency of shipping and erection work. The wall panel can also serve to strengthen the structural body of a house because it is provided with a reinforcing section comprising parallel middle members and braces. Fittings are located in the vicinity of the ends of the middle members and at positions removed from said ends. When the wall panel is used on the lower floor, it is secured by the fittings in the vicinity of the ends of the middle members and, as a result, forces from the second floor beam can be transmitted to the foundation through the reinforcing section. Meanwhile, when the wall panel is used on the upper floor, it is secured by the fittings in said removed positions and the portion between said ends and the fittings can undergo elastic deformation. As a result, the vertical forces acting on the second floor beam and roof beam are reduced, energy is absorbed by the elastic deformation, and damage to the second floor beam, roof beam, and the house itself is reduced.

4. Brief Explanation of the Drawings

FIG. 1 is a perspective view of one working example of the present invention:

FIG. 2 is front view showing the mounting locations of the same working example;

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FIG. 3 is a front view showing the elastic deformation:

FIG. 4 is a front view showing the structure of a conventional wall panel;

FIGS. 5 and 6 are front views illustrating the use of identical load-bearing panels on the upper and lower floors.

2upper member

3lower member

4vertical member

5middle member

6brace

7reinforcing section

11, 12....fitting

14, 15 ...face member

Aouter frame

B.....framework

FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6